**Climate
of the Past
Discussions**

Interactive
Comment

Interactive comment on "Reconstructing glacier-based climates of LGM Europe and Russia – Part 3: Comparison with GCM and pollen-based climate reconstructions" *by* R. Allen et al.

Anonymous Referee #1

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General remarks

This is the last of a series of three papers on glacier-based climate reconstructions. This paper describes a comparison between a glacier-based climate reconstruction with a pollen-based reconstruction qnd with output from a GCM. The scope of the paper is clearly described, the structure of the paper is clear and the analysis is carried out correctly. I suggest that this paper can be accepted with minor revisions provided that the revision of papers #1 and #2 of this series does not lead to substantial changes in the method of reconstructing glacier-based climates and in its results, in which case this third paper would probably also need serious reworking, and consequently re-

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revision. I think that it might have been possible to join parts #2 and 3 and make only one paper out of that, but the option of slicing the work into three papers is defendable.

Specific remarks

- Abstract (and elsewhere): The verb "predict" appears strange to me in this context. One cannot predict something that happened 20000 years ago

- p.1202: Harrison (2003) is a fairly obscure reference. Far too obscure for this to be the guidelines which everybody would use nowadays.

- p. 1205: D=1.852*ARCOS(...). The factor 1.852 is certainly wrong. Using this factor, the equation does not give the distance in km. If ARCOS is given is degrees, the real factor would be 110000 or so. Anyway, the weighting will still be correct even if a wrong factor is used.

- p. 1205: "(using lapse rates)": Maybe a bit more detail would be nice here, even if this is given in the companion paper.

- p. 1208, line 15: "The different seasonality of the LGM climate anomalies..." You only talk about temperature anomalies here. Precipitation seasonality is also interesting because it determines how much of the total falls as snow.

- p. 1211, line 1: The corrections seem to be applied separately. Can one imagine a way of applying both (temperature and precipitation) anomalies at a time? How much "reasonable" precipitation anomaly would be possible? Using this strongest possible precipitation anomaly, what would be the conclusions regarding the temperature errors?

- p. 1211, line 15: precipitation anomalies. What if you applied relative, not absolute anomalies (that is, multiply every monthly mean precipitation value by the

same factor?) Using absolute anomalies as you do, you change the type of precipitation seasonality.

- p. 1212: It appears very clearly that proxy modeling (that is, calculated glacier fractions using the GCM output and compare the modelled glaciers with the geologic evidence) is clearly preferrable over inferring past climate from the glacio-geological evidence, because the latter cannot distinguish between temperature and precipitation effects. I think it would be worth insisting more clearly on this.

- p. 1212; line 12 and following: It is fairly complicated to use the glacier model for the present-day HADCM3 output in order to figure out wether the model has a cold bias. It is much more straightforward, and precise, to simply compare the modelled and observed present-day temperatures. Of course using the glacier model with present-day GCM input is interesting, but not for making the point the authors seem to want to make: HADCM3 is too cold in present summer.

- p. 1213, section head 5.3: "Parametersiation" = typo

- p. 1213, line 14: "greatest affect" should read "greatest effect"

- p. 1214, line 3: "The results suggest that the model parameterisation..." Sorry, I don't understand. Can you please express this more clearly?

- p.1214, line &à and following. Circular argument. A bit like: " We modify the temperature from X to Y, the forward glacier model yields the past glaciers. Using the same glacier model, we find that these past glaciers indicate that the past temperature was Y." Of course. But this does not prove anything. In particular it does not prove that the glacier model is correct.

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